would depend upon the engineer's ability to distinguish between indistinguishable signals. As a matter of fact, the reverse of Professor Stratton's statement is true. Instead of being totally, or even partially, color-blind, "the normal eye, grown accustomed to darkness," is much more sensitive to color than is the retina in daylight vision. Indeed, the increased color-sensitivity of the dark-adapted retina is so striking and so well-known that it has in several instances been made the object of special investigation. And the investigators who have made quantitative determinations of this hyperesthesia to color agree that it amounts to, at least, *two hundredfold.*

Professor Stratton believes that another reason for the misinterpretation of colored signals is to be found in the fact that one "is incapable of seeing correctly the color of objects caught out of the corner of the eye." He represents the engineer as being so occupied with his engine and his time-piece, that he does not even see his signals until he is upon them. "The color of a signal must be caught in its flight to one side" while the engine rushes past in mad career. It seems unnecessary to discuss the question as to whether or not Professor Stratton's dramatic description represents the actual procedure adopted by the engineer in the reading of his signals; but it may be remarked that if engineers really do attempt to interpret signals under the conditions described by the author, the semaphore device which he advocates would prove to be even more defective than the despised system of colored lights. For while it is true that the outlying regions of the retinal surface are relatively insensitive to color, it is also true that these peripheral regions are even less capable of discriminating between spatial forms.

The author errs again in his discussion of the status of "color weakness." It is popularly supposed that there exists a group of individuals who are "weak in their color sense, but by no means color-blind." Professor Stratton promulgates this erroneous conception, notwithstanding the fact that in an examination of several thousand cases of "color weakness" Professor Nagel, of Berlin, found not a single instance of the defect that did not turn out, on closer investigation, to be a familiar case of color-blindness.

Professor Stratton omits to mention that the illuminated semaphore which he recommends is an antiquated expedient. It represents an earlier stage in the evolution of the present system of signaling; it was introduced into the railway service many years ago, but, for reasons which need not be discussed here, it never came into general use. Its failure and ultimate supplanting by colored lights are now a matter of history.

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The Definition of Respiration

To the Editor of Science: In the article "On the Teaching of the Subject of Respiration" in Science for April 19 it is stated that "the confusion of words is inconvenient enough, but there is back of it a confusion of ideas which is more serious and by which the teaching of the subject is more or less impaired." That this is true there is abundant evidence, while a very superficial glance over the recent literature of the subject shows where the trouble lies. If only one authority were consulted little difficulty would result, for the differences are concerned with words rather than with ideas; each book is clear enough if taken by itself; yet the number of definitions of respiration that are available to the student can lead to nothing but confusion. A few brief quotations will illustrate this. Barnes[1] speaks of "another false conception. . . . One often finds respiration described as a gaseous exchange—the taking up of oxygen and giving off of carbon dioxid—a trade between the atmosphere and the body." More recently Loeb[2] has stated, "By respiration we mean the taking up of oxygen and the giving off of CO_2. We shall see later that the latter process can exist independently of the taking up of oxy-

[1] "The Theory of Respiration," Science, February 17, 1905.

[2] "The Dynamics of Living Matter," 1906.

gen." Mathews[3] says that "Respiration is in fact the dissociation of water with the liberation of hydrogen." In recent school text-books there are also wide differences. "The entire process of respiration consists simply of an exchange of gases through a membrane" (Linville and Kelly[4]). "This oxygen consumption is the *respiration* of plants" (Bergen and Davis[5]). "The process by which oxygen is taken into the body and carbon dioxide is given off is *respiration*" (Atkinson[6]). "The escape of carbon dioxide, which follows the taking in of oxygen, is the superficial indication that the very important process called respiration is going on . . . just what happens in respiration is very uncertain, but it involves a series of changes in the living substance itself" (Coulter[7]). These fragmentary quotations sufficiently demonstrate the different points of view. Hough and Sedgwick,[8] in a book which will help to raise the quality of physiology-teaching in our schools, have it that "breathing is not the fundamental act of respiration; . . . this cell breathing is the essential act of respiration, for respiration is only another name for the oxidative processes of the living body"; but later we find, "The consumption of oxygen and the production of carbon dioxide thus involve an interchange of these gases between the blood and the tissues (internal respiration) on the one hand, and between the blood and the air in the lungs (external respiration) on the other." This latter statement is similar to what may be found in most of our school physiologies, and for that reason alone would best define respiration as understood by the great majority of school and college students.

On the whole this conception seems to be the right one. It has the endorsement of the great majority of writers on physiology, while custom, the dictionary and the etymology of the word strongly support it. The present confusion is largely due to the effort to change the meaning of a word that has long been in general use, an effort that as yet seems to be confined to a few plant physiologists.

It is very desirable that the common characteristics of living organisms should not be lost sight of and that botanical physiology should not have a different terminology from zoological. It is also desirable that the language spoken in the laboratory should not differ from that which can be properly used outside. Dr. Shaw says, "To define respiration then as a gaseous exchange is to turn away from the all-important process." We can not agree with this "telling objection." As long as there is such a thing as this peculiar gas exchange some word will be needed for it; "respiration" is evidently that word and should no more turn us away from the vital process than "excretion," "alimentation" or other words necessary to describe the superficial phenomena. While respiration is not fundamental it is by no means unessential; from many points of view it is more important than the disruptive processes within the cell. In the study of anatomy, of adaptations, of habits, and of ecology in its widest sense the nature of the gas exchange and the means by which it is accomplished become of dominant importance.

If the word respiration is to be shifted to the energy-releasing process within the cell some new word will be needed to cover those processes now understood under that term. It would be interesting to know if the meanings of the related words "inspire" and "expire" are to be changed. Also, what becomes of the "organs of respiration"? Do they disappear? Or are we to add to lungs, gills, stomata, etc., such structures as root hairs, kidneys, the intestine or other organs that may be concerned with those exchanges between the organism and its surroundings by which the disruptive process is maintained?

"Respiration," as it has long been understood, is a useful, indeed a necessary, term; the new conception of the energy-releasing processes within the cell deserves to be dignified by a new word. The confusion that once

[3] *Biol. Bull.*, Vol. VIII., May 6, 1905.
[4] "Text-book in General Zoology," 1906.
[5] "Principles of Botany," 1906.
[6] "College Botany," 1905.
[7] "A Text-book of Botany," 1906.
[8] "The Human Mechanism," 1906.

surrounded the conception of "carbon assimilation," or whatever else it was called, has been wonderfully cleared by the adoption of "photosynthesis." It is to be believed that a similar clarifying process would take place, and the thanks of teachers of plant physiology would again be earned by Dr. Barnes, if the word "energesis" could be generally adopted.

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VOLCANIC ACTIVITY IN ALASKA

To the Editor of Science: Mr. Arthur P. Porter, civil engineer and graduate of the Massachusetts Institute of Technology, writing from Elliott Creek, Alaska, under date of May 24, 1907, communicates the following interesting observations:

On and about April 5, several mountains of the Wrangell range in Alaska were active volcanically, sending up great clouds of steam and causing a flood in the Kotsina River that, on April 6, came down past our camp at the mouth of the Kotsina, cut us off from our supply train and prevented our going up the Kotsina on the ice.

To go more into detail, the first we heard about it was on April 1, when we were mushing down the Tonsino River. We stopped for dinner at the camp of some freighters hauling in supplies for the Hubbard-Elliott mine; and Mr. Hubbard said that they could plainly see the smoke (?) and steam rising from Mt. Wrangell. That afternoon and the following day, as we proceeded down the Tonsino and then down the Copper River, we caught occasional distant views of the mountains, but I noted nothing remarkable. (A photograph taken April 2 shows the mountains clear.) On April 5 and 6 we saw great white clouds which always rolled away from the mountains, yet never left them clear; and with the field glasses steam was seen issuing from the sides of the mountains below the tops. We were at the mouth of the Kotsina, about forty miles from the mountains, and could not positively identify the peaks. Apparently, however, Mts. Wrangell, Blackburn and Sanford were all sending up steam.

The next day, April 6, a sudden flood came down the Kotsina on top of the ice and underneath it. There had been no warm weather and no rain (28° below zero instead). The flood lasted two days and then went down. The enclosed photograph shows the head of the flood advancing down the river and spreading over the snow as it came. I stepped on an ice hummock to take the picture; and by the time I could focus my camera, the flood had passed me on both sides and nearly cut me off. The toe of the flood advanced at the rate of fifty feet a minute, actual timing, eating its way through the snow as if the water were warm.

May 28, the mountains seem to be steaming again (Mt. Drum or Mt. Sanford), and others noted the same two days ago.

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RANA PIPIENS

To the Editor of Science: While I was in charge of the neurological work at the University of Chicago, there were published from the laboratory eight papers dealing with the anatomy of the nervous system of the leopard frog. In these publications the species was designated as *Rana virescens brachycephala* (Cope). I have recently learned through the kindness of Dr. Leonhard Stejneger, of the National Museum, that this name is no longer used, and that the correct designation for the leopard frog is *Rana pipiens* (Schreber), as given by Jordan, "Manual of the Vertebrate Animals of the Northern United States," and adopted by Holmes, "Biology of the Frog," 1906, and Miss Dickerson, "The Frog Book," 1906.

In my further studies on the nervous system of the leopard frog, the species will be designated, therefore, as *Rana pipiens*. In view of the fact that there are several investigations on this species still to be published, I take this opportunity of calling attention to the change in name, first, because those of us who are not specially concerned with taxonomy are apt to be confused by such changes, and second, because I wish to emphasize the fact that these later studies will apply to the same species as that used in the earlier investigations.

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